sectioning valves embedding them in an epoxy resin, polishing the cut edges to a high luster and then etching the cut edges with 1% HCl for 1 minute before applying sheet acetate with acetone. After a drying period, the acetate was peeled off and sandwiched between glass slides for microscopic examination.

Successive growth lines clearly separated growth increments and were suggestive of a definite change in microstructural elements in the chondrophores of both *Mya* species. The boundaries of growth increments were more clearly defined by the growth lines in the peels than in thin-sectioned preparations. Research is in progress to accumulate evidence validating the suspected annual periodicity of the growth lines.

**WHY "START" LATE: THE AGE OF FIRST REPRODUCTION IN *MELAMPUS BIDENTATUS*. Jay Balboni-Tashiro, Amy Bowser, George Cohen, Liz Sigel,** and **Patricia Walborn,** Kenyon College, Gambier, Ohio.

Specimens of *Melampus bidentatus* from the Little Sippewisset Marsh (Falmouth, MA, U.S.A.) have been experimental subjects in a broad range of physiological, ecological, and biochemical studies. The Little Sippewisset Marsh population of *Melampus* has been studied by Russell-Hunter and his colleagues for almost two decades. Following elegant studies of the life cycle and life-history (Apley, 1970, *Malacologia* 10:381; Russell-Hunter *et al.*, 1972, *Biol. Bull.*143:623), several other investigations have used specimens of *Melampus* from the Little Sippewisset population. These studies include measurements of respiratory rates (McMahon and Russell-Hunter, 1981, *Biol. Bull.* 161:246), neurosecretion (Price, 1979, *J. Exp. Zoo.* 202:269), water relations (Price, 1980, *J. Exp. Mar. Biol. Ecol.* 45:51), and tidal migrations (Price, 1984, *J. Exp. Mar. Biol. Ecol.* 78:111). Most recently, we have examined the overwintering diapause state in specimens of *Melampus* from the Little Sippewisset Marsh and from a population near Weymouth, Massachusetts (Tashiro *et al.*, 1983, *Biol. Bull.* 165:511). Preliminary age-specific bioenergetic partitioning studies have also been completed, as well as a survey of age-specific gonad changes during the final breeding cycle in the summer of 1983 (Tashiro *et al.*, 1984, *Biol. Bull.* 167:515).

*Melampus bidentatus* is an ellobiid species found in the high littoral zones of semi-enlosed salt marshes along the North American Atlantic coast from New Brunswick (Canada) to Texas (U.S.A.). This species is amphibious, but has a planktonic veliger larva. There is close coupling between spring tide submergence of the *Melampus* habitat and copulation, oviposition, and hatching. Individuals of this species can exist as largely terrestrial animals because of the semilunar synchrony in their reproductive cycles. The studies mentioned above provide evidence of other behavioral and physiological adaptations that potentiate an amphibious existence. In the Little Sippewisset Marsh, individuals of *Melampus* have a life-span of three to four years. The species *Melampus bidentatus* is a simultaneous hermaphrodite, an iteroparous breeder, and previous studies have reported three to four breeding cycles during the summer. The same studies reported that two- and three-year-olds contributed to the reproductive effort during the summer breeding cycles.

For several months each year, whenever the temperature falls below 13°C, individuals enter a diapause state. We feel that diapause imposes physiological constraints on the age of first reproduction. There is protein degrowth in overwintering specimens of *Melampus*, but this degrowth is age-specific, younger animals losing proportionately more protein than older snails. Such protein degrowth is most likely maintenance repair, younger snails having more efficient repair systems that break down tissue protein in order to reutilize amino acids. Rates of protein sythesis appear to be faster in diapausing younger snails (Tashiro, unpublished) and this corroborative evidence bolsters our contention that younger snails have higher rates of maintenance repair. Rates of emergency repair were measured in diapausing snails that had one tentacle ablated (Tashiro, *et al.*, 1983, *Biol. Bull.* 165:511). Again, there was age-specificity, younger animals having higher rates of tentacle regeneration than older animals.

We hypothesize that overwintering repair delays the age of first reproduction in *Melampus bidentatus*. Previous studies had reported reproduction in two- and three-year-olds, with a minimum size for reproduction being about 5.8 mm. However, no age-specific quantification of reproductive effort has been reported for the first breeding cycle of a summer. Degrowth could impose a physiological debit that might not be reconciled by the time of the first breeding cycle. Since degrowth is proportionately greater in younger animals, only three-year-olds might lay eggs during the first breeding of a summer.

We have begun to test our hypothesis by collecting data on gonad changes (dry weight, carbon, protein), age-specific fecundity, and by experimental manipulation of degrowth conditions in the laboratory. Earlier preliminary work on changes in gonad protein during the final breeding cycle of 1983 showed that both two- and three-year-olds lose gonad protein, but two-year-olds have a slower rate of loss. We now have compared gonad and tissue dry weights in post-winter and pre-breeding snails collected in 1985. Post-winter (March) two-year-olds have a gonad to somatic weight ratio of .04, while three-year-olds have a ratio of .06. By the time of the first breeding cycle (late May), the gonad to somatic ratios of two- and three-year-olds were not significantly different. We used a ratio of gonad dry weight to shell length as a crude size-specific index for gonad condition in two- and three-year old specimens of *Melampus*. During the first breeding cycle of 1985, three-year-olds laid eggs and there was a decline in the gonad weight to shell length ratio for this age group. Two-year-olds did not lay eggs during the first breeding cycle and their gonad weight to shell length ratio increased during the first breeding period. Interestingly, during the second breeding cycle in 1985, younger snails appeared to have a smaller reproductive effort in terms of average number of eggs laid.

We feel these preliminary data are partial support for the hypothesis that degrowth is one of the causal agents delimiting the age of first reproduction in specimens of *Melam-*

*pus bidentatus*. Of course, we need to complete long-term analyses of gonad changes and to refine experimental manipulation of degrowth conditions in laboratory setting (e.g. the effects of different temperature regimes). We do know that during the first breeding cycle of 1985, two-year-olds did not contribute to the reproductive effort. Furthermore, the minimum size for reproduction is not 5.8 mm for two-year-olds in the first breeding periods. Our work is continuing this summer and through the next year.

**HOST SPECIFICITY OF AN ECTOPARASITIC SNAIL IN THE GENUS *ODOSTOMIA* IN THE PANAMA BAY REGION (GASTROPODA: PYRAMIDELLIDAE). J.E. Ward.** University of Delaware, College of Marine Studies, Lewes.

Many species of snails in the family Pyramidellidae are ectoparasitic on other marine invertebrates. Varying degrees of host specificity have been reported for many North American and European pyramidellids. However, host preferences of tropical parasitic pyramidellids are not known, and little has been reported on their feeding behavior or ecology.

In this study, ectoparasitic pyramidellids were collected in Panama Bay, Panama, from encrusting organisms. One abundant species was tentatively identified as belonging to the genus *Odostomia*, subgenus *Chrysallida*. Qualitative field and laboratory observations and quantitative choice experiments determined that this species of *Odostomia* feeds preferentially on serpulid polychaete worms. However, these ectoparasites are not host specific and can parasitize several species of bivalves common to the Panama Bay region.